

REMARKS

In the Office Action of April 23, 2007, claims 1-6, 8, 11-16, 20 and 21 were rejected under 35 U.S.C. 102(b) as anticipated by Giger et al. (USP 5,657,362). Claims 7 and 17 were rejected under 35 U.S.C. 103(a) as unpatentable over Giger and a paper of Johns et al. Claims 9, 10, 18 19, 26 and 27 were rejected under 35 U.S.C. 103(a) as unpatentable over Giger and Manueco Santurtun et al. (USP 4,596,029). Claims 22-24 were rejected under 35 U.S.C. 103(a) as unpatentable over Giger and Saito et al. (USP 5,954,650). Claim 25 was rejected under 35 U.S.C. 103(a) as unpatentable over Giger and Saito in view of the Johns paper. Claims 28-30 were rejected under 35 U.S.C. 103(a) as unpatentable over the Johns paper and Giger in view of Saito. And claims 31 and 32 were rejected under 35 U.S.C. 103(c) as unpatentable over the Johns paper and Giger in view of Saito and Manueco Santurtun.

Numerous changes were required in the drawings and replacement sheets are submitted herewith.

The present invention is a variety of methods for processing a medical image so as to produce a processed image from which has been removed certain effects of the physical characteristics of the object being imaged and/or of the apparatus used to form the images. Of particular interest is the removal of fat content in the object being imaged and the claims have been amended accordingly. The invention further provides for the formation of a standardized image from the processed image and for the use of the standardized image or the processed image in the training of computer-aided detection/diagnosis algorithms. These algorithms may then be used to detect abnormalities in other standardized or processed images derived from any of a variety of image acquisition systems.

The claims are directed to different aspects of this invention. Claim 1, as amended, is directed to a method for detecting abnormalities in x-ray medical images by first processing a digital or digitized x-ray medical image to remove distinguishing effects of the fat content in the object being imaged and the x-ray device used to form the medical image. The resulting processed medical image is then processed with a computer aided detection algorithm that has been similarly processed with respect to the same operating parameter(s) or physical characteristic(s) of the x-ray device.

Claim 11, as amended, recites the same first step as claim 1 and the further step of processing the processed image to form a standard form image representative of an image that would be formed at a standard x-ray energy and exposure.

Claim 22 is directed to a method for processing mammographic images. The mammogram is processed to remove effects of the mammography system and the fat content in the breast being imaged. The resulting image is then converted into a standard-form mammogram having pixel values that would have been obtained by a standard form mammography system having a first standard x-ray voltage parameter and first standard exposure parameter.

Claim 28 is directed to a method for processing mammographic images comprising a first step of forming a mammogram of a breast along with images of first and second reference materials having thicknesses that range from 0 to the thickness of the breast where one reference material has an attenuation constant that is approximately the same as that of fat and the other has an attenuation constant that is approximately the same as that of glandular tissue. A first processed image is then formed using exposure information in the images of the first and second reference materials. The processed image is then converted into a standard-form mammogram having pixel values that would have been obtained by a standard-form mammography system having a first standard x-ray voltage parameter and a first standard exposure parameter.

Giger (USP 5,657,362) describes a method and system for detection of masses and parenchymal distortion in medical images such as mammograms.

Applicants submit that the claims as amended distinguish over Giger. In particular, while Giger discloses various processing techniques, she does not disclose or suggest processing the x-ray image so as to remove from the image the effects of fat content in the object being imaged. Since the rejection of all of the claims is based in whole or in part on Giger, it is submitted that all of the claims, as amended, are patentable over the reference cited.

Claims 8 and 11-32 further distinguish over Giger, for example, in their recitation of the step of forming a standard form image. These claims all require the formation of an image representative of the image that would be formed at a standard x-ray energy and exposure. Giger does not disclose or suggest such a step in her disclosure in FIG. 8 of a normalization step 804. As indicated at Col. 6, lines 30-32, this step merely normalizes an image so that its average gray level matches the average gray level of the original image. No suggestion is made of applicants'

claimed step of forming an image representative of the image that would be formed at a standard x-ray energy and exposure.

Claims 22-27, as amended, further define over Giger and Saito in that they are now limited to comparisons of mammograms formed by x-ray mammography systems. Saito discloses methods of comparing images from different types of mammography systems such as x-ray, MRI, etc.

Claims 28-32 further define over Johns in that they require the use of two reference materials having thicknesses that range from 0 to the thickness of the breast. One reference material has an attenuation that is approximately the same as that of fat and the other an attenuation approximately the same as that of glandular tissue. While Johns may disclose the use of reference materials he does not disclose or suggest the use of such materials with a range of thicknesses.

Further, it is respectfully submitted that the references do not suggest their combination to provide the methods recited by the claims.

For the foregoing reasons, the claims as amended are believed to be patentable over the references.

With respect to the requested changes in the specification, the trademarks have been capitalized as requested. It is respectfully submitted that the sentence beginning at page 6, line 16 is correct in the original since the subject of the sentence is singular in number.

Aside from the fee for the extension of time, no additional fee is believed to be due for filing this response. However, if a fee is due, please charge such fee to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310.

If the Examiner believes a telephone interview would expedite prosecution of this application, the Examiner is invited to call applicant's attorney at the number given below.

Respectfully submitted,

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